(19)
Bundesrepublik Deutschland
Deutsches Patent- und Markenamt

(12) **Registered Utility Model**

(10) **DE 201 15 140 U1** (51) Int Cl.[7]: **B22C 9/08**

(21) File name: 201 15 140.5
(22) Application date: 13/09/2001
(47) Registration date: 31/01/2002
(43) Date of disclosure in Patent Gazette: 07/03/2002

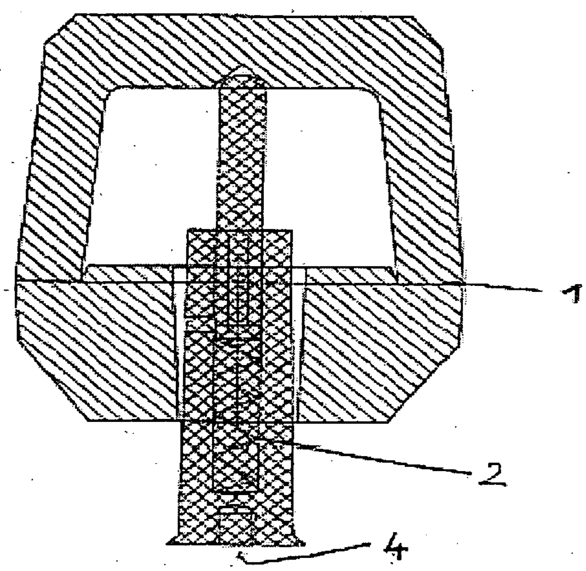
(66) Internal priority:
100 59 481.6 30/11/2000
101 42 357.8 30/08/2001

(73) Owner:
AS Lüngen GmbH & Co. KG, 56170 Bendorf, DE

(74) Representative:
PAe Splanemann Reitzner Baronetzky Westendorp,
80469 Munich

(54) Feeder with a tubular body

(57) A feeder system for a casting with a feeder or feeder head and a tubular body whereby the tubular body connects the feeder or feeder head, either directly or indirectly, to the casting or the mould cavity and helps to form a breaker edge.



PATENTANWÄLTE · EUROPEAN PATENT ATTORNEYS · EUROPEAN TRADEMARK ATTORNEYS
SPLANEMANN REITZNER BARONETZKY WESTENDORP

Dipl.-Ing. R. SPLANEMANN
Dipl.-Chem. Dr. B. REITZNER
Dipl.-Ing. K. BARONETZKY
Dr. M. WESTENDORP, M.phil. (Cantab)

80469 MÜNCHEN
RUMFORDSTRASSE 7
TELEFON: +49(0)89 22 62 07
TELEFAX: +49(0)89 29 76 92

31. August 2001

AS Lüngen GmbH & Co. KG

Hauptstrasse 200

56170 Bendorf/Rhein

OUR REF: 1029-III-21.198

YOUR REF:

Feeder with a tubular body

DESCRIPTION

The invention concerns a feeder system for a casting with a feeder (head) and a tubular body.

When moulded parts are produced in a foundry, a casting mould is filled with molten metal. As the casting solidifies, the volume of the poured metal reduces. It is therefore usual to use so-called feeders, that is, open or closed cavities in or on the mould, to compensate for the shrinkage as the casting solidifies and to prevent the formation of shrink holes in the casting. For this reason, feeders are connected to the casting or to the part of the casting at risk and generally arranged above or at the side of the mould cavity.

Innumerable feeders are known in the state of the art. For example, DE

196 42 838 A1 describes a feeder for a metallic casting in the shape of a bell with a reduced bell edge formed by a flat annulus placed on it.

DE 41 19 192 A1 describes a flexible mandrel to retain feeders. In this, the feeder inserts are placed on a mandrel connected to the casting mould and preferably moulded in the cope. Since the feeder material is very pliable and the pressure of the sand can easily cause damage to the feeder in use during moulding in the moulding equipment, it is understood in the art that the mandrel can be designed to flex and move axially so that the moulded feeder can avoid the pressure of the sand in the direction of the pattern.

Normally, feeders are arranged at gate height and also provided with heat-insulating material or exothermic amounts such the molten metal in the feeder solidifies later than the casting. After solidification, the feeder remains attached to the casting, requiring that the feeder residue must then be separated. In this operation, in many instances it is difficult to obtain a clean and simple separation. Generally, after separating the feeder, the surface of the casting has to be deburred and smoothed. This is a time-consuming and relatively expensive operation which can also cause damage to the surface of the casting where it joined the feeder. Often, so-called breaker cores (also breaker edge, sand strip or knock-off feeder cores) are provided to reduce this type of damage and to make separation of the feeder easier. These are inserted between the feeder and the mould and require appropriate support surfaces.

Overall, the known feeders are either relatively costly in their construction or in handling when producing the mould, and/or do not ensure simple and precise separation of the feeder residue from the completed casting or require a relatively large support surface.

The aim of this invention is to provide a feeder system that avoids the disadvantages present in the state of the art and, in particular, whose construction is simple, can be placed or moulded on to the casting mould, and that requires only small support surfaces and, thus, enables a precisely-positioned breaker edge to be provided directly on the casting to ensure a simple and safe separation of the feeder residue from the completed casting.

This task is solved by a feeder system in accordance with Claim 1. Design versions that offer advantages are given in the dependent claims.

In this document, the term "feeder" includes any form of feeder, feeder envelope, feeder insert, feeder cap and exothermic pad known in the state of the art or of which an expert is familiar.

This invention can be used in principle for all types of feeder in which the tubular body can be arranged in the manner described below.

This invention is particularly suited to so-called mini-feeders that are conventionally moulded with breaker cores or with the assistance of a flexible mandrel.

The feeder system according to the invention consists of at least two parts. Firstly, a feeder or feeder head, provided on the side opposite

the casting, has a cavity to accept the molten metal during pouring.

A tubular body, which, either directly or indirectly, connects the cavity formed by the feeder head with the cavity in the mould, joins up to the casting.

The tubular body can be of any length, wall thickness and diameter suited to each individual case. The wall thickness lies generally, depending on the material used, between 0.1 and 10 mm, but particularly between 0.3 and 5 mm and, preferably, between 0.3 and 0.5 mm. The optimum dimensions can be determined for each individual case by conducting routine tests or will be known by experts based on their experience. The wall thicknesses will vary due to the material used and may, for example, fall between about 0.3 and 0.5 mm for sheet steel and when using a flexible mandrel mini-feeder.

Generally, the length of the tubular body lies between about 15 and about 300 mm, and, particularly, between about 35 and about 100 mm. The length of the tubular body is selected in one design version according to the invention such that the gap between the feeder (before moulding and, if necessary, on the mandrel) and the casting is bridged.

The internal diameter of the tubular body can, in principle, be any size as long as the aperture is large enough to allow the molten metal to flow into and, respectively, out of the feeder during the pouring and solidifying process. The diameter of the tubular body tends to be generally, but not necessarily, in keeping with the inner diameter of the feeder since, according to one design version of this invention, the

tubular body is fitted or inserted into the feeder (head). It is possible, however, to apply it on or in the feeder (head) in another manner.

The tubular body can be of any cross-sectional shape, in particular, round, oval or four (or more) -sided.

According to one design version of this invention, the tubular body is in the shape of a tube with an essentially uniform cross section along its entire length. Preferably, the ratio of the wall thickness to the overall diameter of the tube is between about 1:2 and 1:200, in particular 1:5 to 1:120 and, preferably 1:10 to 1:100. The ratio of the length to the tube's overall diameter is preferably between 1:4 and 15:1, in particular 1:1 and 6:1. The ratios depend mainly on the geometry of the feeder and casting mould.

The feeder or feeder head can be formed from any insulating and/or exothermic material known in the state of the art to ensure that the molten metal in the feeder solidifies later than the casting. As an example, the feeder can be made from the exothermic feeder materials revealed by the same applicant in DE 199 25 167.

The tubular body can be formed from any suitable material that is strong enough and will not cause any harmful reactions on the casting being produced. These materials are known to any relevant expert and can include, as examples, metal, plastic, cardboard, ceramics or similar materials.

According to one preferred design version, the tubular body consists of a material similar to that involved in the casting programme such as aluminium or sheet steel.

In an advantageous design version of the tubular body in this invention, its outer circumference is tight against the feeder or feeder head and is preferably secured to the feeder (head) using a means of which an expert in this field will be familiar, such as an adhesive like a hot-melt adhesive or water glass cement, or a wedge or by a tight fit. It can also be simply inserted into the feeder (head).

In another preferred design version of the invention, the tubular body can move in relation to the feeder or feeder head and/or the casting or, as the case may be, the mould cavity at least within certain limits. This means that, on the one hand, the application of the feeder is made particularly simple, and, on the other hand, it provides optimal positioning of the breaker edge through the displacement between the feeder and tubular body or between the tubular body and the casting as the forming or compaction of the moulding material takes place.

In doing so, due to the compaction of the moulding material and the corresponding relative displacement between the feeder, or, respectively, the tubular body and the casting or, respectively, the mould cavity, it is easy to adjust the gap between the tubular body and the casting before moulding so that, after shaping or after compaction of the mould material, the tubular body forms an optimally positioned breaker edge that is located as close as possible to the finished casting.

In one preferred design version of the invention the tubular body tapers towards the casting and forms a breaker edge directly at the transition to the casting mould or in its immediate vicinity. Of course, in one version of the invention, the (internal) diameter of a certain section, preferably the section towards the casting, can taper or narrow. In so doing, the tubular body provides, on the one hand, a mouldable feeder neck, and, on the other hand, a precise and firmly positioned breaker edge. The breaker edge is preferably provided as a constriction of the aperture, or, respectively, of the internal diameter on or in the vicinity of the end of the tubular body towards the casting.

In another design version according to the invention, the tubular body does not, however, taper towards the casting, or, in other words, its cross section does not taper. In this case it is advantageous to push the tubular body, for example, an essentially cylindrical tube, over a mandrel, in particular, a flexible or guide mandrel until the end of the tubular body towards the casting is resting on the base of the mandrel near the casting. When this is done, a small gap is formed between the tubular body and the (base of the) mandrel. It has been shown that this gap, together with air inclusions in this region during moulding, can provide an acceptable breaker edge. Furthermore, as stated earlier, the location and formation of the breaker edge can be optimised by suitable dimensioning of the tubular body, such as by using a relatively narrow tube with a small diameter or an appropriate arrangement of the feeder or feeder head, so that this latter, after forming or compacting of the moulding material, lies very close to (but not directly on) the casting.

As mentioned above, a preferred design version the feeder system according to the invention includes, furthermore, a mandrel, in particular a flexible mandrel.

The feeder connected with the tube (tubular body) is held up appropriately by the flexible mandrel. Thus the tube stands on the mould or on the angled base of the flexible mandrel. During the forming process, the feeder is guided over the tube downwards by the flexible mandrel to the corresponding end position. The tube remains firmly in its original position. A defined breaker edge directly on the casting is thereby assured.

In this way, any core, mandrel or flexible mandrel that appears to be suitable to an expert can be used within the scope of this invention. Towards the casting, the tubular body can either reach completely over the flexible mandrel or can rest on its base. In both cases, (directly or indirectly), a connection is created between the mould cavity and the tubular body.

According to another advantageous design version of the invention, the tubular body can be used as a substitute flexible mandrel or guide mandrel. In this case, the feeder is guided over the tubular body which rests on the casting mould. Centring is done, if necessary, using a fixed mandrel that vary in length. Preferably, the fixed mandrel is no longer than the length of the tubular body. However, in many cases is can be of advantage to have a fixed mandrel shorter than

the tubular body with the latter pushed at least partly over the fixed mandrel. During compaction, the feeder is then pushed over the tubular body. In an advantageous design version of the invention, the feeder is destroyed in the upper region by the tubular body. The broken feeder portion is thus embedded in the moulding sand.

The tubular body must be adapted for each casting such that the gap between the feeder and the casting still allows an adequate feed. Frequently this gap is between 5 and 25 mm.

The top of the tubular body can be either open or closed.

According to one advantageous design version of the invention, the tubular body, if it is open on the side away from the casting, can be supported by a relatively long support mandrel, where the tubular body can then be made preferably from a rigid material, such as sheet steel, with, for example, a material thickness of about 0.7 mm. Other rigid materials can be used to advantage such as plastic, like PE, or ceramics. Preferably holes are provided in the upper region of the tubular body to ensure good ignition of the feeder. Holes or apertures should not be provided the tubular body towards the casting since they could result in the inclusion of moulding sand when moulding is taking place.

In another design version of the invention, it was found that, in some cases, for ease of handling, it can be preferable if, before moulding or compaction of the moulding material takes place, the tubular body is not in direct contact with the casting or the mould cavity or does not

rest on the flexible mandrel (if present).

In this case, the feeder system is designed in such a way that, during the moulding or compaction of the moulding material, the tubular body moves towards the casting or mould cavity. According to this design version of the invention, the tubular body is designed to be relatively thin-walled so that, during the moulding or compaction of the moulding material, it can sever at the casting. This can be made easier by providing the tubular body with some form of sharp edge at the end towards the casting or reducing its wall thickness at that point or by thinning it substantially.

It is advantageous if, in so doing, the feeder system is dimensioned and adapted according to the casting such that, with a suitable spring travel, a defined breaker edge is formed between the feeder and the casting after moulding or final compacting of the moulding material on the tubular body.

It is advantageous if, to enable the tubular body to be pushed or severed during the compaction of the moulding material, it has, on the one hand, a relatively thin wall enabling it to be pressed up to the casting or the mould cavity by the moulding material. For preference, the wall thickness of the tubular body is about 0.05 to 0.1 mm, in particular 0.2 to 0.5 mm, using a rigid material such as sheet steel, plastic or ceramic. The tube wall must naturally be stable enough to avoid being destroyed during the compaction of the moulding material so that the feed cannot penetrate between the mould cavity and the feeder. Thus the wall thickness of the tubular body in any particular case will depend on the material used.

An expert in this field will be familiar with suitable wall thicknesses depending on the material selected or they can be optimised by conducting routine tests.

In a preferred design version, the severing process is helped if the tubular body meets a stop or shoulder in the feeder and is thereby forced, together with the feeder or feeder head, towards the casting.

This support can take the form of a stop or shoulder. In this instance, a stop is understood to mean a periphery, particularly an internal periphery of the feeder or feeder head that contacts at least the end of the tubular body away from the casting at a point or across the face during the moulding or compaction of the moulding material.

Naturally, the support of the tubular body with respect to the feeder or feeder head can be achieved also by using appropriate cementing, wedging or fitting between the tubular body and the feeder or feeder head, as described already, for example, in DE 100 59 481.6, or by a support point or support surface that supports the tubular body with respect to the feeder or feeder head at least after the moulding or compaction of the moulding material.

If a flexible mandrel is present, it is preferable that, before the moulding or compaction of the moulding material, the tubular body does not rest on the base of the flexible mandrel, but moves during compaction of the moulding material to the base of the flexible mandrel. According to the invention, it is also possible that the tubular body, in the absence of a flexible mandrel, can sever or, respectively, move by itself to the casting or mould cavity.

It was found that the feeder system forming the invention could be very easily and consistently applied and formed and a reproducible and optimally-positioned breaker edge was assured, and when using a mandrel or flexible mandrel. After the moulding process and, if needed, removing the core or (flexible) mandrel, the tubular body remains in the mould. Assembly of the feeder system can be done either at the factory or at the customer's on the casting mould.

Furthermore, the feeder system forming this invention makes other processes superfluous to produce a breaker edge, such as the use of conventional breaker cores, one example being a Croning breaker core.

Insofar, according to these design versions of the invention, that reference was also made to the configuration of the feeder or feeder head, of the tubular body, of the flexible or guide mandrel or of the fixed mandrel in relation to the casting or, respectively, the mould cavity, a further aspect of this invention concerns a pouring arrangement encompassing the feeder system defined here and the casting/mould cavity (and a moulding material) or, as the case may be, a process to prepare a casting mould using the feeder system in this invention.

The invention is described in more detail using the attached drawings, in which

Figure 1 shows a conventional feeder with a flexible mandrel;

Figure 2 shows a feeder system according to the invention with a tubular body that tapers in towards the casting;

Figure 3a illustrates a feeder system with a tubular body according to the invention before moulding or, respectively, compaction of the moulding material;

Figure 3b shows a feeder system with a tubular body according to the invention after compaction of the moulding material; and

Figures 4a and 4b illustrate another design version of the feeder system according to the invention in which the tubular body has apertures or holes, as the case may be, in the portion away from the casting.

According to Figure 1, a conventional feeder 1 made from an exothermic and/or insulating material is placed over a flexible mandrel 2 on the casting 4. No optimal breaker edge is formed for separating or knocking off the feeder residue.

A feeder system according to the invention is shown in Figure 2 in which a tubular body 3, tapering towards the casting 4, is guided over the flexible mandrel 2. This forms a breaker edge 5. The tubular body tapers towards the casting and rests on the base or plinth 6 of the flexible mandrel. A feeder (head) 1 rests on the tube and a bead of hot-melt adhesive 7 is run between the feeder and the circumference of the tube to form a seal. After moulding, the feeder adopts the position shown by the broad cross-hatching, in which relative movement takes

place between the tubular body and the feeder and the positioning of the breaker edge on the tubular body remains unchanged with respect to the casting. This ensures optimal positioning of the breaker edge regardless of the final position of the feeder after the moulding operation.

Figure 3 illustrates a feeder system according to the invention in which a projection or stop 8 is provided for the tubular body 3 on the internal wall of the feeder (head) 1. The tubular body 3 tapers towards the casting or mould cavity 4 and, during the moulding or compaction of the moulding material, can sever or move towards the casting.

As explained in the description, the spring travel can be adjusted when compaction of the moulding material is taking place such that the breaker edge forms at the base of the mandrel 2 near the casting. It is also possible that the tubular body does not taper and is shaped essentially cylindrically.

Figure 3a shows the feeder system before compaction of the moulding material where the end of the tubular body pointed towards the casting is not resting on the base 9 of the flexible mandrel, nor is it in direct contact with the casting or the mould cavity.

Figure 3b shows the feeder system after compaction of the moulding material where the tubular body is in direct contact with the mould cavity or is resting on the base 9 of the flexible mandrel 2, if present, or is resting on the casting.

Figures 4a and 4b illustrate another design version according to the invention in which the tubular body 3 has apertures or holes 10, as the case may be, in the portion away from the casting.

In the design version shown, immediately before moulding or compaction of the moulding material, the tubular body is resting on the casting 4. After moulding or compaction of the moulding material (Figure 4b), the feeder head 1 has been deliberately destroyed in the upper region 1', there having been a relative movement between the tubular body 3 and the feeder head 1.

CLAIMS

1. A feeder system for a casting with a feeder or feeder head and a tubular body, whereby the tubular body connects the feeder or feeder head, either directly or indirectly, to the casting or the mould cavity, as the case may be, and assists in forming a breaker edge.

2. A feeder system in accordance with Claim 1, characterised in that the tubular body in general has a uniform diameter and is, in particular, cylindrical or, in general, cylindrical in shape.

3. A feeder system in accordance with one of the previous claims, characterised in that the tubular body tapers towards the end adjacent to the casting, tapering in cross section or having an internal diameter that narrows.

4. A feeder system in accordance with one of the previous claims, characterised in that a stop or shoulder is provided in the feeder or feeder head for the end of the tubular body away from the casting or mould cavity.

5. A feeder system in accordance with one of the previous claims, characterised in that the stop involves a projection on the internal side of the feeder or feeder head.

6. Characterised in that the stop, or shoulder, comprises several support points or, as the case may be, an annular support surface.

7. A feeder system in accordance with one of the previous claims, characterised in that the stop, or shoulder, is provided on the internal side wall or the upper internal wall of the feeder or feeder head.

8. A feeder system in accordance with one of the previous claims, characterised in that the tubular body is relatively thin-walled so that it can sever or move to the casting during the moulding or compaction of the moulding material.

9. A feeder system in accordance with one of the previous claims, characterised in that, during the moulding or compaction of the moulding material, the tubular body generally moves, not with respect to the casting or the mould cavity, but with respect to the feeder or feeder head.

10. A feeder system in accordance with Claims 1 to 9, characterised in that, during the moulding or compaction of the moulding material, the tubular body generally moves, not with respect to the feeder or feeder head, but with respect to the casting or the mould cavity.

11. A feeder system in accordance with one of the previous claims, characterised in that a flexible mandrel or guide mandrel is also present and the tubular body, at least partly, is pushed over it.

12. A feeder system in accordance with one of the previous claims, characterised in that, before the moulding or compaction of the moulding material, the tubular body is not standing with the side adjacent to the casting or mould cavity on the mould or on the flexible mandrel or guide mandrel.

13. A feeder system in accordance with one of the previous claims, characterised in that the feeder or feeder head, the tubular body and, if involved, the flexible mandrel or guide mandrel are dimensioned in such a way that, after the moulding or compaction of the moulding material, the tubular body forms a breaker edge on the side towards the casting and the feeder or feeder head is not resting directly on the casting or mould cavity.

14. A feeder system in accordance with one of the previous claims, characterised in that the tubular body, at least after the moulding or compaction of the moulding material, rests on the base of the flexible mandrel or guide mandrel and thereby forms a breaker edge close to the casting.

15. A feeder system in accordance with one of the previous claims, characterised in that the feeder or feeder head, the tubular body and, if involved, the flexible mandrel or guide mandrel are arranged in such a way that, during the moulding or compaction of the moulding material, the upper part of the feeder or feeder head is destroyed by the tubular body.

16. A feeder system in accordance with Claim 15, characterised in that the tubular body replaces the flexible mandrel or guide mandrel and, if necessary, a fixed mandrel is provided for centring the tubular body.

17. A feeder system in accordance with Claim 16, characterised in that the fixed mandrel is no longer than the tubular body, but is preferably shorter and the tubular body is pushed, at least partly, over the fixed mandrel.

18. A casting arrangement containing a feeder system in accordance with one of the previous claims, a casting or mould cavity and a moulding material, characterised in that, before moulding or compaction of the moulding material, the tubular body is applied and then placed on the feeder or feeder head.

19. A casting arrangement in accordance with Claim 18, characterised in that, before moulding or compaction of the moulding material, the tubular body is not in direct contact with the casting or mould cavity, or rests on the mandrel, if present, but severs at the casting during compaction of the moulding material.

13.09.01

Fig. 1

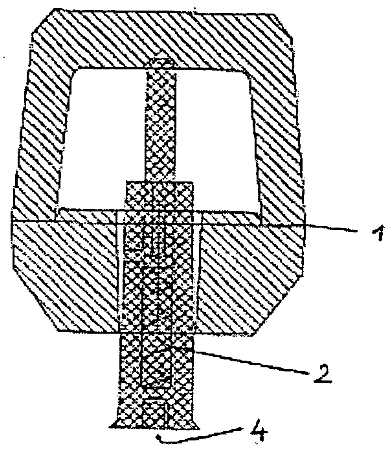
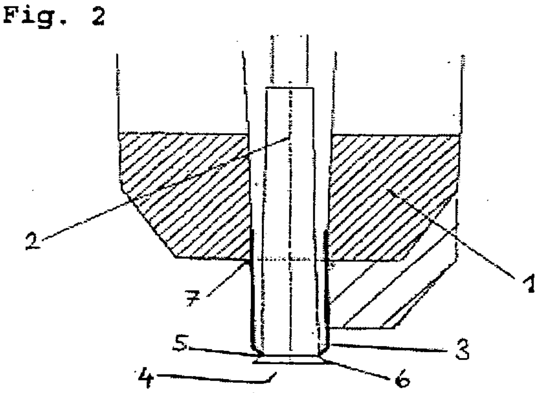


Fig. 2



DE 201 15 140 U1

Fig. 3a

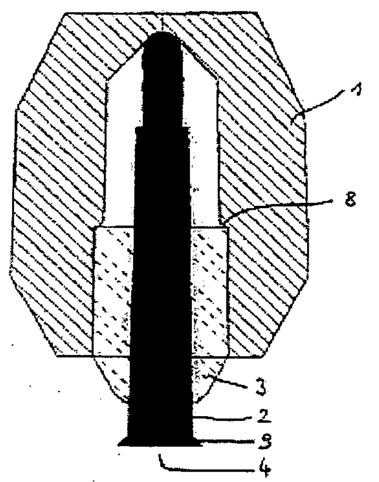


Fig. 3b

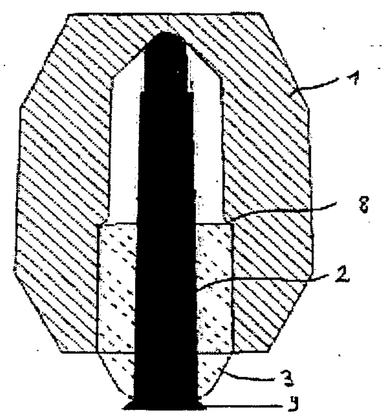


Fig. 4a

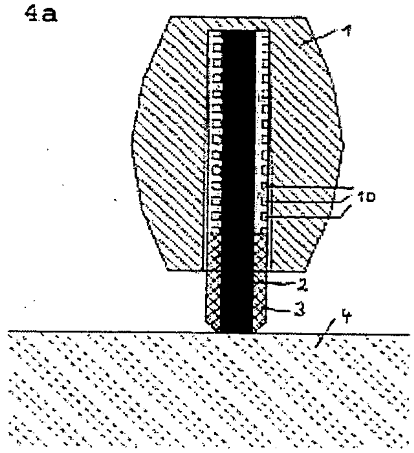


Fig. 4b